SEQUENCE LISTING

<110> Sorge, Joseph
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Connie, Hansen

<120> Compositions and Methods Utilizing DNA Polymerases

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<150> 60/162,600
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Glu Val Trp Val Leu Tyr Phe Thr His Pro Gln Asp Val Pro Ala Ile
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Arg Asp Lys Ile Arg Lys His Pro Ala Val Ile Asp Ile Tyr Glu Tyr
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Asp Ile Pro Phe Ala Lys Arg Tyr Leu Ile Asp Lys Gly Leu Ile Pro
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Asn Val Ser Pro Asp Thr Leu Asn Arg Glu Gly Cys Arg Ser Tyr Asp
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Val Ala Pro Glu Val Gly His Lys Phe Cys Lys Asp Phe Pro Gly Phe
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nnnnnnnnnn nnnnnnnnnn cccggggact tcatactggc ggtaatagac agggattcct 4620
tcctcaagga cttcccggga ggcattggag ttttttggtg gggctttcac aggatttgct 4680
catcttgtgg atttctcgtt cgattgaatc tgtccacttg agggtgtagg tcgagacggt 4740
ggagcgcgta ttccgggagc gggtcttgag gctccatttt tcagtcctcc tccggcgaag 4800
aagtggaact caagccgggt gttagcttat gttatgttcc caactcctcc agcacctcca 4860
ggatcccctc aatcccggaa cctcgaagcc cctctcgtgg atctttctaa cttcctctgc 4920
ctccgggttt atccagaccg cccacatgcc ggctctcagc gcaccctcga aatcctccgc 4980
gtaggtgtcg ccgatgtgga ttgcctcgtc cggctcgacc ccgaagcatc gagcggtttt 5040
ctgaacatct cgggcatcgg cttatacgcc agaacctcgt cggcgaagaa ggttccctca 5100
atgtagtcca tcaggccgaa cctctcgagg gggggcccgg tacccaattc gccctatagt 5160
gagtcgatta caattcactg gccgtcgttt tacaacgtcg tgactgggaa aaccctggcg 5220
ttacccaact taagtcgctt tgcagcacat ccccc 5255

<210> 5
<211> 8
<212> PRT
<213> Thermococcus sp. JDF-3

<220>
<221> UNSURE
<222> (2)..(3)
<223> X = unknown

<220>
<221> UNSURE
<222> (6)..(6)
<223> X = unknown

<400> 5

Lys Xaa Xaa Asn Ser Xaa Tyr Gly
1 5

<210> 6
<211> 10
<212> PRT
<213> Thermococcus sp. JDF-3

<220>
<221> UNSURE
<222> (2)..(4)
<223> unknown

<220>
<221> VARIANT
<222> (5)..(5)
<223> X = F or Y

<400> 6

Lys Xaa Xaa Xaa Xaa Gly Xaa Xaa Tyr Gly
1 5 10

<210> 7
<211> 10
<212> PRT
<213> Thermococcus sp. JDF-3

<220>
<221> UNSURE
<222> (2)..(3)
<223> X = unknown

<400> 7

Asp Xaa Xaa Ser Leu Tyr Pro Ser Ile Ile
1 5 10

<210> 8
<211> 10
<212> PRT
<213> Thermococcus sp. JDF-3

<400> 8

Asp Phe Arg Ser Leu Tyr Leu Ser Ile Ile
1 5 10

<210> 9
<211> 10
<212> PRT
<213> Thermococcus sp. JDF-3

<400> 9

Asp Phe Arg Ser His Tyr Pro Ser Ile Ile
1 5 10

<210> 10
<211> 10
<212> PRT
<213> Thermococcus sp. JDF-3

<400> 10

Asp Phe Arg Ser Phe Tyr Pro Ser Ile Ile
1 5 10

<210> 11
<211> 30
<212> DNA
<213> Artificial/Unknown

<220>
<221> misc_feature
<222> ()..()
<223> Synthetic oligonucleotide PCR primer

<400> 11
gggaaacata tgatccttga cgttgattac 30

<210> 12
<211> 31
<212> DNA
<213> Artificial/Unknown

<220>
<221> misc_feature
<222> ()..()
<223> Synthetic oligonucleotide PCR primer

<400> 12
gggaaaggat cctcacttct tcttcccctt c 31

<210> 13
<211> 34
<212> DNA
<213> Artificial/Unknown

<220>
<221> misc_feature
<222> ()..()
<223> Synthetic oligonucleotide primer

<400> 13
tcagatgaat tcgatgatcc ttgacgttga ttac 34

<210> 14
<211> 54
<212> DNA
<213> Artificial/Unknown

<220>
<221> misc_feature
<222> ()..()
<223> Synthetic oligonucleotide primer

<400> 14
gagagaattc ataatgataa ggaggaaaaa attatgatcc ttgacgttga ttac 54

<210> 15
<211> 31
<212> DNA
<213> Artificial/Unknown

<220>
<221> misc_feature
<222> ()..()
<223> Synthetic oligonucleotide primer

<400> 15
tcagatctcg agtcacttct tcttcccctt c 31

<210> 16
<211> 29
<212> DNA
<213> Artificial/Unknown

<220>
<221> misc_feature
<222> ()..()
<223> Synthetic oligonucleotide sequencing primer

<400> 16
ccagctttcc agactagtcg gccaaggcc 29

<210> 17
<211> 16
<212> DNA
<213> Artificial/Unknown

<220>
<221> misc_feature
<222> ()..()
<223> Synthetic oligonucleotide sequencing primer

<400> 17
aactctcgac ccgctg 16

<210> 18
<211> 37
<212> DNA
<213> Artificial/Unknown

<220>
<221> misc_feature
<222> ()..()
<223> Synthetic oligonucleotide primer

<400> 18
ggtttcccag tcacgacgtt gtaaaacgac ggccagt 37

<210> 19
<211> 18
<212> DNA
<213> Artificial/Unknown

<220>
<221> misc_feature
<222> ()..()
<223> First strand of synthetic oligonucleotide duplex

<400> 19
taacgttggg gggggca 18

<210> 20
<211> 18
<212> DNA
<213> Artificial/Unknown

<220>
<221> misc_feature
<222> ()..()
<223> Second strand of synthetic oligonucleotide duplex

<400> 20
tgcaaccccc ccccgtat 18

<210> 21
<211> 139
<212> PRT
<213> Thermococcus sp. JDF-3

<220>
<221> UNSURE
<222> (6)..(6)
<223> X = unknown

<400> 21

Leu Val Cys Asn Ala Xaa Ser Thr Gly Asn Leu Val Glu Trp Phe Leu
1 5 10 15

Leu Arg Lys Ala Tyr Glu Arg Asn Glu Leu Ala Pro Asn Lys Pro Asp
20 25 30

Glu Arg Glu Leu Ala Arg Arg Arg Gly Gly Tyr Ala Gly Gly Tyr Val
35 40 45

Lys Glu Pro Glu Arg Gly Leu Trp Asp Asn Ile Val Tyr Leu Asp Phe
50 55 60

Arg Ser Leu Tyr Pro Ser Ile Ile Ile Thr His Asn Val Ser Pro Asp
65 70 75 80

Thr Leu Asn Arg Glu Gly Cys Arg Ser Tyr Asp Val Ala Pro Glu Val
85 90 95

Gly His Lys Phe Cys Lys Asp Phe Pro Gly Phe Ile Pro Ser Leu Leu
100 105 110

Gly Asn Leu Leu Glu Glu Arg Gln Lys Ile Lys Arg Lys Met Lys Ala
115 120 125

Thr Leu Asp Pro Leu Glu Lys Asn Leu Leu Asp
130 135

<210> 22
<211> 140
<212> PRT
<213> Thermococcus sp. JDF-3

<400> 22

Val Trp Asp Val Ser Arg Ser Ser Thr Gly Asn Leu Val Glu Arg Phe
1 5 10 15

Leu Leu Arg Lys Ala Tyr Glu Arg Asn Glu Leu Ala Pro Asn Lys Pro
20 25 30

Asp Glu Arg Glu Leu Ala Arg Arg Arg Gly Gly Tyr Ala Gly Gly Tyr
35 40 45

Val Lys Glu Pro Glu Arg Gly Leu Trp Asp Asn Ile Val Tyr Leu Asp
50 55 60

Phe Arg Ser Leu Tyr Pro Ser Ile Ile Ile Thr His Ser Val Ser Pro
65 70 75 80

Asp Thr Leu Asp Arg Glu Gly Cys Arg Ser Tyr Asp Val Ala Pro Glu
85 90 95

Val Gly His Lys Phe Cys Lys Asp Phe Pro Gly Phe Ile Pro Ser Leu
100 105 110

Leu Gly Asn Leu Leu Glu Glu Arg Gln Lys Ile Lys Arg Lys Met Lys
115 120 125

Ala Thr Leu Asp Pro Leu Glu Lys Asn Leu Leu Asp
130 135 140

<210> 23
<211> 140
<212> PRT
<213> Thermococcus sp. JDF-3

<400> 23

Val Trp Asp Val Ser Arg Ser Ser Thr Gly Asn Leu Val Glu Trp Phe
1 5 10 15

Leu Leu Arg Lys Ala Tyr Glu Arg Asn Glu Leu Ala Pro Asn Lys Pro
20 25 30

Asp Glu Arg Glu Leu Ala Arg Arg Arg Gly Gly Tyr Ala Gly Gly Tyr
35 40 45

Val Lys Glu Pro Glu Arg Gly Leu Trp Asp Asn Ile Val Tyr Leu Asp
50 55 60

Phe Arg Ser Leu Tyr Pro Ser Ile Ile Ile Thr His Asn Val Ser Pro
65 70 75 80

Asp Thr Leu Asn Arg Glu Gly Cys Arg Ser Tyr Asp Val Ala Pro Glu
85 90 95

Val Gly His Lys Phe Cys Lys Asp Phe Pro Gly Phe Ile Pro Ser Leu
100 105 110

Leu Gly Asn Leu Leu Glu Glu Arg Gln Lys Ile Lys Arg Lys Met Lys
115 120 125

Ala Thr Leu Asp Pro Leu Glu Lys Asn Leu Leu Asp
130 135 140

<210> 24
<211> 140
<212> PRT
<213> Thermococcus sp. JDF-3

<400> 24

Val Trp Asp Val Ser Arg Ser Ser Thr Gly Asn Leu Val Glu Trp Phe
1 5 10 15

Leu Leu Arg Lys Ala Tyr Glu Arg Asn Glu Leu Ala Pro Asn Lys Pro
20 25 30

Asp Glu Arg Glu Leu Ala Arg Arg Arg Gly Gly Tyr Ala Gly Gly Tyr
35 40 45

Val Lys Glu Pro Glu Arg Gly Leu Trp Asp Asn Ile Val Tyr Leu Asp
50 55 60

Phe Arg Ser Leu Tyr Pro Ser Ile Ile Ile Thr His Asn Val Ser Pro
65 70 75 80

Asp Thr Leu Asn Arg Glu Gly Cys Arg Ser Tyr Asp Val Ala Pro Glu
85 90 95

Val Gly His Lys Phe Cys Lys Asp Phe Pro Gly Phe Ile Pro Ser Leu
100 105 110

Leu Gly Asn Leu Leu Glu Glu Arg Gln Lys Ile Lys Met Lys Met Lys
115 120 125

Ala Thr Leu Asp Pro Leu Glu Lys Asn Leu Leu Asp
130 135 140

<210> 25
<211> 140
<212> PRT
<213> Thermococcus sp. JDF-3

<400> 25

```
Val Trp Asp Val Ser Arg Ser Ser Thr Gly Asn Leu Val Glu Trp Phe
1               5                  10                  15

Leu Leu Arg Lys Ala Tyr Glu Arg Asn Glu Leu Ala Pro Asn Lys Pro
            20                  25                  30

Asp Glu Arg Glu Leu Ala Arg Arg Arg Gly Gly Tyr Ala Gly Gly Tyr
        35                  40                  45

Val Lys Glu Pro Glu Arg Gly Leu Trp Asp Asn Ile Val Tyr Leu Asp
    50                  55                  60

Phe Arg Ser Leu Tyr Pro Ser Ile Ile Ile Thr His Asn Val Ser Pro
65                  70                  75                  80

Asp Thr Leu Asn Arg Glu Gly Cys Arg Ser Tyr Asp Val Ala Pro Glu
                85                  90                  95

Val Gly His Lys Phe Cys Lys Asp Phe Pro Gly Phe Ile Pro Ser Leu
            100                 105                 110

Leu Gly Asn Leu Leu Glu Glu Arg Gln Lys Ile Lys Arg Lys Met Lys
        115                 120                 125

Ala Thr Leu Asp Pro Leu Glu Lys Asn Leu Leu Asp
    130                 135                 140
```

<210> 26
<211> 140
<212> PRT
<213> Thermococcus sp. JDF-3

<220>
<221> UNSURE
<222> (5)..(5)
<223> X = unknown

<400> 26

```
Val Trp Asp Val Xaa Arg Ser Ser Thr Gly Asn Leu Val Glu Trp Phe
1               5                  10                  15

Leu Leu Arg Lys Ala Tyr Glu Arg Asn Glu Leu Ala Pro Asn Lys Pro
            20                  25                  30

Asp Glu Arg Glu Leu Ala Arg Arg Arg Gly Gly Tyr Ala Gly Gly Tyr
        35                  40                  45

Val Lys Glu Pro Glu Arg Gly Gln Trp Asp Asn Ile Ala Tyr Leu Asp
    50                  55                  60

Phe Arg Ser Leu Tyr Pro Ser Ile Ile Ile Thr His Asn Val Ser Pro
65                  70                  75                  80

Asp Thr Leu Lys Arg Glu Gly Cys Arg Ser Tyr Asp Val Ala Pro Glu
                85                  90                  95

Val Gly His Lys Phe Cys Lys Asp Phe Pro Gly Phe Ile Pro Ser Leu
            100                 105                 110

Leu Gly Asn Leu Leu Glu Glu Arg Gln Lys Ile Lys Arg Lys Met Lys
        115                 120                 125

Ala Thr Leu Asp Pro Leu Glu Lys Asn Leu Leu Asp
```

130 135 140

<210> 27
<211> 140
<212> PRT
<213> Thermococcus sp. JDF-3

<400> 27

Val Trp Asp Val Pro Arg Ser Ser Thr Gly Asn Leu Val Glu Trp Phe
1 5 10 15

Leu Leu Arg Lys Ala Tyr Glu Arg Asn Glu Leu Ala Pro Asn Lys Pro
20 25 30

Asp Glu Arg Glu Leu Ala Arg Arg Arg Gly Gly Tyr Ala Gly Gly Tyr
35 40 45

Val Lys Glu Pro Glu Arg Gly Leu Trp Asp Asn Ile Val Tyr Leu Asp
50 55 60

Phe Arg Ser Leu Tyr Pro Ser Ile Ile Ile Thr His Asn Val Ser Pro
65 70 75 80

Asp Thr Leu Asn Arg Glu Gly Cys Arg Ser Tyr Asp Val Ala Pro Glu
85 90 95

Val Gly His Lys Phe Cys Lys Asp Phe Pro Gly Phe Ile Pro Ser Leu
100 105 110

Leu Gly Asn Leu Leu Glu Glu Arg Gln Lys Ile Lys Arg Lys Met Lys
115 120 125

Ala Thr Leu Asp Pro Leu Glu Lys Asn Leu Leu Asp
130 135 140

<210> 28
<211> 140
<212> PRT
<213> Thermococcus sp. JDF-3

<220>
<221> UNSURE
<222> (92)..(92)
<223> X = unknown

<400> 28

Val Trp Asp Val Ser Arg Ser Ser Thr Gly Asn Leu Val Glu Trp Phe
1 5 10 15

Leu Leu Arg Lys Ala Tyr Glu Arg Asn Glu Leu Ala Pro Asn Lys Pro
20 25 30

Asp Glu Arg Glu Leu Ala Arg Arg Arg Gly Gly Tyr Ala Gly Gly Tyr
35 40 45

Val Lys Glu Pro Glu Arg Gly Leu Trp Asp Asn Ile Val Tyr Leu Asp
50 55 60

Phe Arg Ser Leu Tyr Pro Ser Ile Ile Ile Thr His Asn Val Ser Pro
65 70 75 80

Asp Thr Leu Asn Arg Glu Gly Cys Arg Ser Tyr Xaa Val Ala Pro Glu

```
                85                  90                  95

Val Gly His Lys Phe Cys Lys Asp Phe Pro Gly Phe Ile Pro Ser Leu
            100                 105                 110

Leu Gly Asn Leu Leu Glu Glu Arg Gln Lys Ile Lys Arg Lys Met Lys
        115                 120                 125

Ala Thr Leu Asp Pro Leu Glu Lys Asn Leu Leu Asp
    130                 135                 140
```

<210> 29
<211> 140
<212> PRT
<213> Thermococcus sp. JDF-3

<220>
<221> UNSURE
<222> (92)..(92)
<223> X = Unknown

<400> 29

```
Val Trp Asp Val Ser Arg Ser Ser Thr Gly Asn Leu Val Glu Trp Phe
1               5                   10                  15

Leu Leu Arg Lys Ala Tyr Glu Arg Asn Glu Leu Ala Pro Asn Lys Pro
            20                  25                  30

Asp Glu Arg Glu Leu Ala Arg Arg Arg Gly Gly Tyr Ala Gly Gly Tyr
        35                  40                  45

Val Lys Glu Pro Glu Arg Gly Pro Trp Asp Asn Ile Val Tyr Leu Asp
    50                  55                  60

Phe Arg Ser Leu Tyr Pro Ser Ile Ile Ile Thr His Asn Val Ser Pro
65                  70                  75                  80

Asp Thr Leu Asn Arg Glu Gly Cys Arg Ser Tyr Xaa Val Ala Pro Glu
                85                  90                  95

Val Gly His Lys Phe Cys Lys Asp Phe Pro Gly Phe Ile Pro Ser Leu
            100                 105                 110

Leu Gly Asn Leu Leu Glu Val Arg Gln Lys Ile Lys Arg Lys Met Lys
        115                 120                 125

Ala Thr Leu Asp Pro Leu Glu Lys Asn Leu Leu Asp
    130                 135                 140
```

<210> 30
<211> 140
<212> PRT
<213> Thermococcus sp. JDF-3

<400> 30

```
Val Trp Asp Val Ser Arg Ser Ser Thr Gly Asn Leu Val Glu Trp Phe
1               5                   10                  15

Leu Leu Arg Lys Ala Tyr Glu Arg Asn Lys Leu Ala Pro Asn Lys Pro
            20                  25                  30

Asp Glu Arg Glu Leu Ala Arg Arg Arg Gly Gly Tyr Ala Gly Gly Tyr
```

```
        35                  40                  45

Val Lys Glu Pro Glu Arg Gly Leu Trp Asp Asn Ile Val Tyr Leu Asp
    50                  55                  60

Phe Arg Ser Leu Tyr Pro Ser Ile Ile Ile Thr His Asn Val Ser Pro
65                  70                  75                  80

Asp Thr Leu Asn Arg Glu Gly Cys Arg Ser Tyr Asp Val Ala Pro Glu
                85                  90                  95

Val Gly His Lys Phe Cys Lys Asp Phe Pro Gly Phe Ile Pro Ser Leu
            100                 105                 110

Leu Gly Asn Leu Leu Glu Glu Arg Gln Lys Ile Lys Arg Lys Met Lys
        115                 120                 125

Ala Thr Leu Asp Pro Leu Glu Lys Asn Leu Leu Asp
    130                 135                 140
```

<210> 31
<211> 140
<212> PRT
<213> Thermococcus sp. JDF-3

<220>
<221> UNSURE
<222> (4)..(4)
<223> X = unknown

<220>
<221> UNSURE
<222> (6)..(6)
<223> X = unknown

<400> 31

```
Tyr Trp Ser Xaa Pro Xaa Leu Arg Thr Gly Asn Leu Val Glu Trp Phe
1               5                   10                  15

Leu Leu Arg Lys Ala Tyr Glu Arg Asn Glu Leu Ala Pro Asn Lys Pro
            20                  25                  30

Asp Glu Arg Glu Leu Ala Arg Arg Arg Gly Gly Tyr Ala Gly Gly Tyr
        35                  40                  45

Val Lys Glu Pro Glu Arg Gly Leu Trp Asp Asn Ile Val Tyr Leu Asp
    50                  55                  60

Phe Arg Ser Leu Tyr Pro Ser Ile Ile Ile Thr His Asn Val Ser Pro
65                  70                  75                  80

Asp Thr Leu Asn Arg Glu Gly Cys Arg Ser Tyr Asp Val Ala Pro Glu
                85                  90                  95

Val Gly His Lys Phe Cys Lys Asp Phe Pro Gly Phe Ile Pro Ser Leu
            100                 105                 110

Leu Gly Asn Pro Leu Glu Glu Arg Gln Lys Ile Lys Arg Lys Met Lys
        115                 120                 125

Ala Thr Leu Asp Pro Leu Glu Lys Asn Leu Leu Asp
    130                 135                 140
```

<210> 32
<211> 141
<212> PRT
<213> Thermococcus sp. JDF-3

<220>
<221> Unsure
<222> (5)..(5)
<223> X = unknown

<400> 32

Val Asp Gly Thr Xaa Pro Arg Ser Ser Thr Gly Asn Leu Val Glu Trp
1 5 10 15

Phe Leu Leu Arg Lys Ala Tyr Glu Arg Asn Glu Leu Ala Pro Asn Lys
20 25 30

Pro Asp Glu Arg Glu Leu Ala Arg Arg Arg Gly Gly Tyr Ala Gly Gly
35 40 45

Tyr Val Lys Glu Pro Glu Arg Gly Leu Trp Asp Asn Ile Val Tyr Leu
50 55 60

Asp Phe Arg Ser His Tyr Pro Ser Ile Ile Ile Thr His Asn Val Ser
65 70 75 80

Pro Asp Thr Leu Asn Arg Glu Gly Cys Arg Ser Tyr Asp Val Ala Pro
85 90 95

Glu Asp Gly His Lys Phe Cys Lys Asp Phe Pro Gly Phe Ile Pro Ser
100 105 110

Leu Leu Gly Asn Leu Leu Glu Glu Arg Gln Lys Ile Lys Arg Lys Met
115 120 125

Lys Ala Thr Leu Asp Pro Leu Glu Lys Asn His Leu Asp
130 135 140

<210> 33
<211> 143
<212> PRT
<213> Thermococcus sp. JDF-3

<220>
<221> Unsure
<222> (1)..(3)
<223> X = unknown

<400> 33

Xaa Xaa Xaa Phe Trp Asp Val Ser Arg Ser Ser Thr Gly Asn Leu Val
1 5 10 15

Glu Trp Phe Leu Leu Arg Lys Ala Tyr Glu Arg Asn Glu Leu Ala Pro
20 25 30

Asn Lys Pro Asp Glu Arg Glu Leu Ala Arg Arg Arg Gly Gly Tyr Ala
35 40 45

Gly Gly Tyr Val Lys Glu Pro Glu Arg Gly Leu Trp Asp Asn Ile Val
50 55 60

```
Tyr Leu Asp Phe Arg Ser Leu Tyr Pro Ser Ile Ile Ile Thr His Asn
65                  70                  75                  80

Val Ser Pro Asp Thr Leu Asn Arg Glu Gly Cys Arg Ser Tyr Asp Val
                85                  90                  95

Ala Pro Glu Val Gly His Lys Phe Cys Lys Asp Phe Pro Gly Phe Ile
            100                 105                 110

Pro Ser Leu Leu Gly Asn Leu Leu Glu Glu Arg Gln Lys Ile Lys Arg
        115                 120                 125

Lys Met Lys Ala Thr Leu Asp Pro Leu Glu Lys Asn Leu Leu Asp
    130                 135                 140
```

<210> 34
<211> 180
<212> PRT
<213> Thermococcus sp. JDF-3

<400> 34

```
Thr Gly Glu Gly Leu Glu Arg Val Ala Arg Tyr Ser Met Glu Asp Ala
1               5                   10                  15

Arg Val Thr Tyr Glu Leu Gly Arg Glu Phe Phe Pro Met Glu Ala Gln
            20                  25                  30

Leu Ser Arg Leu Ile Gly Gln Gly Asp Trp Asp Val Ser Arg Ser Ser
        35                  40                  45

Thr Gly Asn Leu Val Glu Trp Phe Leu Leu Arg Lys Ala Tyr Glu Arg
    50                  55                  60

Asn Glu Leu Ala Pro Asn Lys Pro Asp Glu Arg Glu Leu Ala Arg Arg
65                  70                  75                  80

Arg Gly Gly Tyr Ala Gly Gly Tyr Val Lys Glu Pro Glu Arg Gly Leu
                85                  90                  95

Trp Asp Asn Ile Val Tyr Leu Asp Phe Arg Ser Leu Tyr Pro Ser Ile
            100                 105                 110

Ile Ile Thr His Asn Val Ser Pro Asp Thr Leu Asn Arg Glu Gly Cys
        115                 120                 125

Arg Ser Tyr Asp Val Ala Pro Glu Val Gly His Lys Phe Cys Lys Asp
    130                 135                 140

Phe Pro Gly Phe Ile Pro Ser Leu Leu Gly Asn Leu Leu Glu Glu Arg
145                 150                 155                 160

Gln Lys Ile Lys Arg Lys Met Lys Ala Thr Leu Asp Pro Leu Glu Lys
                165                 170                 175

Asn Leu Leu Asp
            180
```

<210> 35
<211> 180
<212> PRT
<213> Thermococcus sp. JDF-3

<400> 35

```
Tyr Arg Gln Arg Ala Ile Lys Ile Leu Ala Asn Ser Tyr Tyr Gly Tyr
1               5                  10                  15

Cys Gly Tyr Ala Arg Ala Arg Trp Tyr Cys Arg Glu Cys Ala Glu Ser
            20                  25                  30

Val Thr Ala Trp Gly Arg Glu Tyr Ile Glu Met Val Ile Arg Glu Leu
        35                  40                  45

Glu Glu Lys Phe Gly Phe Lys Val Leu Tyr Ala Asp Thr Asp Gly Leu
    50                  55                  60

His Ala Thr Ile Pro Gly Ala Asp Ala Glu Thr Val Lys Lys Lys Ala
65                  70                  75                  80

Met Glu Phe Leu Asn Tyr Ile Asn Pro Lys Leu Pro Gly Leu Leu Glu
                85                  90                  95

Leu Glu Tyr Glu Gly Phe Tyr Val Arg Gly Phe Phe Val Thr Lys Lys
            100                 105                 110

Lys Tyr Ala Val Ile Asp Glu Glu Gly Lys Ile Thr Thr Arg Gly Leu
        115                 120                 125

Glu Ile Val Arg Arg Asp Trp Ser Glu Ile Ala Lys Glu Thr Gln Ala
    130                 135                 140

Arg Val Leu Glu Ala Val Leu Arg His Gly Asp Val Glu Glu Ala Val
145                 150                 155                 160

Arg Ile Val Arg Glu Val Thr Glu Lys Leu Ser Lys Tyr Glu Val Pro
                165                 170                 175

Pro Glu Lys Leu
            180
```

<210> 36
<211> 180
<212> PRT
<213> Thermococcus sp. JDF-3

<400> 36

```
Tyr Arg Gln Arg Ala Ile Lys Ile Leu Ala Asn Ser Tyr Tyr Gly Tyr
1               5                  10                  15

Tyr Gly Tyr Ala Arg Ala Arg Trp Tyr Cys Arg Glu Cys Ala Glu Ser
            20                  25                  30

Val Thr Ala Trp Gly Arg Glu Tyr Ile Glu Met Val Ile Arg Glu Leu
        35                  40                  45

Glu Glu Lys Phe Gly Phe Lys Val Leu Tyr Ala Asp Thr Asp Gly Leu
    50                  55                  60

His Ala Thr Ile Pro Gly Ala Asp Ala Glu Thr Val Lys Lys Lys Ala
65                  70                  75                  80

Met Glu Phe Leu Asn Tyr Ile Asn Pro Lys Leu Pro Gly Leu Leu Glu
                85                  90                  95

Leu Glu Tyr Glu Gly Phe Tyr Val Arg Gly Phe Phe Val Thr Lys Lys
            100                 105                 110
```

Lys Tyr Ala Val Ile Asp Glu Glu Gly Lys Ile Thr Thr Arg Gly Leu
115 120 125

Glu Ile Val Arg Arg Asp Trp Ser Glu Ile Ala Lys Glu Thr Gln Ala
130 135 140

Arg Val Leu Glu Ala Ile Leu Arg His Gly Asp Val Glu Glu Ala Val
145 150 155 160

Arg Ile Val Arg Glu Val Thr Glu Lys Leu Ser Lys Tyr Glu Val Pro
165 170 175

Pro Glu Glu Leu
180

<210> 37
<211> 180
<212> PRT
<213> Thermococcus sp. JDF-3

<400> 37

Tyr Arg Gln Arg Ala Ile Lys Ile Leu Ala Asn Ser Tyr Tyr Gly Tyr
1 5 10 15

Tyr Gly Tyr Ala Arg Ala Arg Trp Tyr Cys Arg Glu Cys Ala Glu Ser
20 25 30

Val Thr Ala Trp Gly Arg Glu Tyr Ile Glu Met Val Ile Arg Glu Leu
35 40 45

Glu Glu Lys Phe Gly Phe Lys Val Leu Tyr Ala Asp Thr Asp Gly Leu
50 55 60

His Ala Thr Ile Pro Gly Ala Asp Ala Glu Thr Val Lys Lys Lys Ala
65 70 75 80

Met Glu Phe Leu Asn Tyr Ile Asn Pro Lys Leu Pro Gly Leu Leu Glu
85 90 95

Leu Glu Tyr Glu Gly Phe Tyr Val Arg Gly Phe Phe Val Thr Lys Lys
100 105 110

Lys Tyr Ala Val Ile Asp Glu Glu Gly Lys Ile Thr Thr Arg Gly Leu
115 120 125

Glu Ile Val Arg Arg Asp Trp Ser Glu Ile Ala Lys Glu Thr Gln Ala
130 135 140

Arg Val Leu Glu Ala Ile Leu Arg His Gly Asp Val Glu Glu Ala Val
145 150 155 160

Arg Ile Val Arg Lys Val Thr Glu Lys Leu Ser Lys Tyr Glu Val Pro
165 170 175

Pro Glu Lys Leu
180

<210> 38
<211> 180
<212> PRT
<213> Thermococcus sp. JDF-3

<400> 38

Tyr Arg Gln Arg Ala Ile Lys Ile Leu Ala Asn Ser Tyr Tyr Gly Tyr
1 5 10 15

Tyr Gly Tyr Ala Arg Ala Arg Trp Tyr Cys Arg Glu Cys Ala Glu Ser
20 25 30

Val Thr Ala Trp Gly Arg Glu Tyr Ile Glu Met Val Ile Arg Glu Leu
35 40 45

Glu Glu Lys Phe Gly Phe Lys Val Leu Tyr Ala Asp Thr Asp Gly Leu
50 55 60

His Ala Thr Ile Pro Gly Ala Asp Ala Glu Thr Val Lys Lys Lys Ala
65 70 75 80

Met Glu Phe Leu Asn Tyr Ile Asn Pro Lys Leu Pro Gly Leu Leu Glu
85 90 95

Leu Lys Tyr Glu Gly Phe Tyr Val Arg Gly Phe Phe Val Thr Lys Lys
100 105 110

Lys Tyr Ala Val Ile Asp Glu Glu Gly Lys Ile Thr Thr Arg Gly Leu
115 120 125

Glu Ile Val Arg Arg Asp Trp Ser Glu Ile Ala Lys Glu Thr Gln Ala
130 135 140

Arg Val Leu Glu Ala Ile Leu Arg His Gly Asp Val Glu Glu Ala Val
145 150 155 160

Arg Ile Val Arg Glu Val Thr Glu Lys Leu Ser Lys Tyr Glu Val Pro
165 170 175

Pro Glu Lys Leu
180

<210> 39
<211> 180
<212> PRT
<213> Thermococcus sp. JDF-3

<400> 39

Tyr Arg Gln Arg Ala Ile Lys Ile Leu Ala Asn Asn Tyr Tyr Gly Tyr
1 5 10 15

Tyr Gly Tyr Ala Arg Ala Arg Trp Tyr Cys Arg Glu Cys Ala Glu Ser
20 25 30

Val Thr Ala Trp Gly Arg Glu Tyr Ile Glu Met Val Ile Arg Glu Leu
35 40 45

Glu Glu Lys Phe Gly Phe Lys Val Leu Tyr Ala Asp Thr Asp Gly Leu
50 55 60

His Ala Thr Ile Pro Gly Ala Asp Ala Glu Thr Val Lys Lys Lys Ala
65 70 75 80

Met Glu Phe Leu Asn Tyr Ile Asn Pro Lys Leu Pro Gly Leu Leu Glu
85 90 95

Leu Glu Tyr Glu Gly Phe Tyr Val Arg Gly Phe Phe Val Thr Lys Lys
100 105 110

Lys Tyr Ala Val Ile Asp Glu Glu Gly Lys Ile Thr Thr Arg Gly Leu

```
        115                 120                 125

Glu Ile Val Arg Arg Asp Trp Ser Glu Ile Ala Lys Glu Thr Gln Ala
    130                 135                 140

Arg Val Leu Glu Ala Ile Leu Arg His Asp Asp Val Glu Glu Ala Val
145                 150                 155                 160

Arg Ile Val Arg Glu Val Thr Glu Lys Leu Ser Lys Tyr Glu Val Pro
                165                 170                 175

Pro Glu Lys Leu
            180

<210>  40
<211>  180
<212>  PRT
<213>  Thermococcus sp. JDF-3

<220>
<221>  Unsure
<222>  (114)..(114)
<223>  X = Unknown


<400>  40

Tyr Arg Gln Arg Ala Ile Lys Ile Leu Ala Asn Ser Tyr Tyr Gly Tyr
1               5                   10                  15

Tyr Gly Tyr Ala Arg Ala Arg Trp Tyr Cys Arg Glu Cys Ala Glu Ser
            20                  25                  30

Val Thr Ala Trp Gly Arg Glu Tyr Ile Glu Met Val Ile Arg Glu Leu
        35                  40                  45

Glu Glu Lys Phe Gly Phe Lys Val Leu Tyr Ala Asp Thr Asp Gly Leu
    50                  55                  60

His Ala Thr Ile Pro Gly Ala Asp Ala Glu Thr Val Lys Lys Lys Ala
65                  70                  75                  80

Met Glu Phe Leu Asn Tyr Ile Asn Leu Lys Leu Pro Gly Leu Leu Glu
                85                  90                  95

Leu Glu Tyr Glu Gly Phe Tyr Val Arg Gly Phe Phe Val Thr Lys Lys
            100                 105                 110

Lys Xaa Ala Val Ile Asp Glu Glu Gly Lys Ile Thr Thr Arg Gly Leu
        115                 120                 125

Glu Ile Val Arg Arg Asp Trp Ser Lys Ile Ala Lys Glu Thr Gln Ala
    130                 135                 140

Arg Val Leu Glu Ala Ile Leu Arg His Gly Asp Val Glu Glu Ala Ile
145                 150                 155                 160

Arg Ile Val Arg Glu Val Thr Glu Lys Leu Ser Lys Tyr Glu Val Pro
                165                 170                 175

Pro Glu Lys Leu
            180

<210>  41
<211>  180
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<212> PRT
<213> Thermococcus sp. JDF-3

<400> 41

Tyr Arg Gln Arg Ala Ile Lys Ile Leu Ala Asn Ser Tyr Tyr Gly Tyr
1 5 10 15

Tyr Gly Tyr Ala Arg Ala Arg Trp Tyr Cys Arg Glu Cys Ala Glu Ser
20 25 30

Val Thr Ala Trp Gly Arg Glu Tyr Ile Glu Met Val Ile Arg Glu Leu
35 40 45

Glu Glu Lys Phe Gly Phe Lys Val Leu Tyr Ala Asp Thr Asp Gly Leu
50 55 60

His Ala Thr Ile Pro Gly Ala Asp Ala Glu Thr Val Lys Lys Lys Ala
65 70 75 80

Met Glu Phe Leu Asn Tyr Ile Asn Pro Lys Leu Pro Gly Leu Leu Glu
85 90 95

Leu Glu Tyr Glu Gly Phe Tyr Val Arg Gly Phe Phe Val Thr Lys Lys
100 105 110

Lys Tyr Ala Val Ile Asp Glu Glu Gly Lys Ile Ala Thr Arg Gly Leu
115 120 125

Glu Ile Val Arg Arg Asp Trp Ser Glu Ile Ala Lys Glu Thr Gln Ala
130 135 140

Arg Val Leu Glu Ala Ile Leu Arg His Gly Asp Val Glu Glu Ala Val
145 150 155 160

Arg Ile Val Arg Glu Val Thr Glu Lys Leu Ser Lys Tyr Glu Val Pro
165 170 175

Pro Glu Lys Leu
180

<210> 42
<211> 180
<212> PRT
<213> Thermococcus sp. JDF-3

<400> 42

Tyr Arg Gln Arg Ala Ile Lys Ile Leu Ala Asn Ser Tyr Tyr Gly Tyr
1 5 10 15

Tyr Gly Tyr Ala Arg Ala Arg Trp Tyr Cys Arg Glu Cys Ala Glu Ser
20 25 30

Val Thr Ala Trp Gly Arg Glu Tyr Ile Glu Met Val Ile Arg Glu Leu
35 40 45

Glu Glu Lys Phe Gly Phe Lys Val Leu Tyr Ala Asp Thr Asp Gly Leu
50 55 60

His Ala Thr Ile Pro Gly Ala Asp Ala Glu Thr Val Lys Lys Lys Ala
65 70 75 80

Met Glu Phe Leu Asn Tyr Ile Asn Pro Lys Leu Pro Gly Leu Leu Glu
85 90 95

Leu Glu Tyr Glu Gly Phe Tyr Val Arg Gly Phe Phe Val Thr Lys Lys
100 105 110

Lys Tyr Ala Val Ile Asp Glu Glu Gly Lys Ile Thr Thr Arg Gly Leu
115 120 125

Glu Ile Val Arg Arg Asp Trp Ser Glu Ile Ala Lys Glu Thr Gln Ala
130 135 140

Arg Val Leu Glu Ala Ile Leu Arg His Gly Asp Val Glu Glu Ala Val
145 150 155 160

Arg Ile Val Arg Glu Val Thr Glu Lys Leu Asn Lys Tyr Glu Val Pro
165 170 175

Pro Glu Lys Leu
180

<210> 43
<211> 180
<212> PRT
<213> Thermococcus sp. JDF-3

<400> 43

Tyr Arg Gln Arg Ala Ile Lys Ile Leu Ala Asn Ser Tyr Tyr Gly Tyr
1 5 10 15

Tyr Gly Tyr Ala Arg Ala Arg Trp Tyr Cys Arg Glu Cys Ala Glu Ser
20 25 30

Val Thr Ala Trp Gly Arg Glu Tyr Ile Glu Met Val Ile Arg Glu Leu
35 40 45

Glu Glu Lys Phe Gly Phe Lys Val Leu Tyr Ala Asp Thr Asp Gly Leu
50 55 60

His Ala Thr Ile Pro Gly Ala Asp Ala Glu Thr Val Lys Lys Lys Ala
65 70 75 80

Met Glu Phe Leu Asn Tyr Ile Asn Pro Lys Leu Pro Gly Leu Leu Glu
85 90 95

Leu Glu Tyr Glu Gly Phe Tyr Val Arg Gly Phe Phe Val Thr Lys Lys
100 105 110

Lys Tyr Ala Val Ile Asp Glu Glu Gly Lys Ile Thr Thr Arg Gly Leu
115 120 125

Glu Ile Val Arg Arg Asp Trp Ser Glu Ile Ala Lys Glu Thr Gln Ala
130 135 140

Arg Val Leu Glu Ala Ile Leu Arg His Gly Asp Val Glu Glu Ala Val
145 150 155 160

Arg Ile Val Arg Glu Val Thr Glu Lys Leu Ser Lys Tyr Glu Val Pro
165 170 175

Pro Glu Lys Leu
180

<210> 44
<211> 180
<212> PRT

<213> Thermococcus sp. JDF-3

<400> 44

Tyr Arg Gln Arg Ala Ile Lys Ile Leu Ala Asn Ser Tyr Tyr Gly Tyr
1 5 10 15

Tyr Gly Tyr Ala Arg Ala Arg Trp Tyr Cys Arg Glu Cys Ala Glu Ser
20 25 30

Val Thr Ala Trp Gly Arg Glu Tyr Ile Glu Met Val Ile Arg Glu Leu
35 40 45

Glu Glu Lys Phe Gly Phe Lys Val Leu Tyr Ala Asp Thr Asp Gly Leu
50 55 60

His Ala Thr Ile Pro Gly Ala Asp Ala Glu Thr Val Lys Lys Lys Ala
65 70 75 80

Met Glu Phe Leu Asn Tyr Ile Asn Pro Lys Leu Pro Gly Leu Leu Glu
85 90 95

Pro Glu Tyr Glu Gly Phe Tyr Val Arg Gly Phe Phe Val Thr Lys Lys
100 105 110

Lys Tyr Ala Val Ile Asp Glu Glu Gly Lys Ile Thr Thr Arg Gly Leu
115 120 125

Glu Ile Val Arg Arg Asp Trp Ser Glu Ile Ala Lys Glu Thr Gln Ala
130 135 140

Arg Val Leu Glu Ala Ile Leu Arg His Gly Asp Val Glu Glu Ala Val
145 150 155 160

Arg Ile Val Arg Glu Val Thr Glu Lys Leu Ser Lys Tyr Glu Val Pro
165 170 175

Pro Glu Lys Leu
180

<210> 45
<211> 180
<212> PRT
<213> Thermococcus sp. JDF-3

<400> 45

Tyr Arg Gln Arg Ala Ile Lys Ile Leu Ala Asn Ser Tyr Tyr Gly Tyr
1 5 10 15

Tyr Gly Tyr Ala Arg Ala Arg Trp Tyr Cys Arg Glu Cys Ala Glu Ser
20 25 30

Val Thr Ala Trp Gly Arg Glu Tyr Ile Glu Met Val Ile Arg Glu Leu
35 40 45

Glu Glu Lys Phe Gly Phe Lys Val Leu Tyr Ala Asp Thr Asp Gly Leu
50 55 60

His Ala Thr Ile Pro Gly Ala Asp Ala Glu Thr Val Lys Lys Lys Ala
65 70 75 80

Met Glu Phe Leu Asn Tyr Ile Asn Pro Lys Leu Pro Gly Leu Leu Glu
85 90 95

Leu Glu Tyr Glu Gly Phe Tyr Val Arg Gly Phe Phe Val Thr Lys Lys
100 105 110

Lys Tyr Ala Val Ile Asp Glu Glu Gly Lys Ile Thr Thr Arg Gly Leu
115 120 125

Glu Ile Val Arg Arg Asp Trp Ser Glu Ile Ala Lys Glu Thr Gln Ala
130 135 140

Arg Val Leu Glu Ala Ile Leu Arg His Gly Asp Val Glu Glu Ala Val
145 150 155 160

Arg Ile Val Arg Glu Val Thr Glu Lys Leu Ser Lys Tyr Glu Val Pro
165 170 175

Pro Val Lys Leu
180

<210> 46
<211> 180
<212> PRT
<213> Thermococcus sp. JDF-3

<400> 46

Tyr Arg Gln Arg Ala Ile Lys Ile Leu Ala Asn Ser Tyr Tyr Gly Tyr
1 5 10 15

Tyr Gly Tyr Ala Arg Ala Arg Trp Tyr Cys Arg Glu Cys Ala Glu Ser
20 25 30

Val Thr Ala Trp Gly Arg Glu Tyr Ile Glu Met Val Ile Arg Glu Leu
35 40 45

Glu Glu Lys Phe Gly Phe Lys Val Leu Tyr Ala Asp Thr Asp Gly Leu
50 55 60

His Ala Thr Ile Pro Gly Ala Asp Ala Glu Thr Val Lys Lys Lys Ala
65 70 75 80

Met Glu Phe Leu Asn Tyr Ile Asn Pro Lys Leu Pro Gly Leu Leu Glu
85 90 95

Leu Glu Tyr Glu Gly Phe Tyr Val Arg Gly Phe Phe Val Thr Lys Lys
100 105 110

Lys Tyr Ala Val Ile Asp Glu Glu Gly Lys Ile Thr Thr Arg Gly Leu
115 120 125

Glu Ile Val Arg Arg Asp Trp Ser Glu Ile Ala Lys Glu Thr Gln Ala
130 135 140

Arg Val Leu Glu Ala Ile Leu Arg His Gly Asp Val Glu Glu Ala Val
145 150 155 160

Arg Ile Val Arg Glu Val Thr Glu Lys Leu Ser Lys Tyr Glu Val Pro
165 170 175

Pro Gly Glu Ala
180

<210> 47
<211> 180
<212> PRT
<213> Thermococcus sp. JDF-3

<400> 47

Tyr Arg Gln Arg Ala Ile Lys Ile Leu Ala Asn Ser Tyr Tyr Gly Asn
1 5 10 15

Tyr Gly Tyr Ala Arg Ala Arg Trp Tyr Cys Arg Glu Cys Ala Glu Ser
20 25 30

Val Thr Ala Trp Gly Arg Glu Tyr Ile Glu Met Val Ile Arg Glu Leu
35 40 45

Glu Glu Lys Phe Gly Phe Lys Val Leu Tyr Ala Asp Thr Asp Gly Leu
50 55 60

His Ala Thr Ile Pro Gly Ala Asp Ala Glu Thr Val Lys Lys Lys Ala
65 70 75 80

Met Glu Phe Leu Asn Tyr Ile Asn Pro Lys Leu Pro Gly Leu Leu Glu
85 90 95

Leu Glu Tyr Glu Gly Phe Tyr Val Arg Gly Phe Phe Val Thr Lys Lys
100 105 110

Lys Tyr Ala Val Ile Asp Glu Glu Gly Lys Ile Thr Thr Arg Gly Leu
115 120 125

Glu Ile Val Arg Arg Asp Trp Ser Glu Ile Ala Lys Glu Thr Gln Ala
130 135 140

Arg Val Leu Glu Ala Ile Leu Arg His Gly Asp Val Glu Glu Ala Val
145 150 155 160

Arg Ile Val Arg Glu Val Thr Glu Lys Leu Ser Lys Tyr Glu Val Pro
165 170 175

Pro Glu Lys Leu
180

<210> 48
<211> 180
<212> PRT
<213> Thermococcus sp. JDF-3

<400> 48

Tyr Arg Gln Arg Ala Ile Lys Ile Leu Ala Asn Ser Tyr Tyr Gly Tyr
1 5 10 15

Tyr Gly Tyr Ala Arg Ala Arg Trp Tyr Cys Arg Glu Cys Ala Glu Ser
20 25 30

Val Thr Ala Trp Gly Arg Glu Tyr Ile Glu Met Val Ile Arg Glu Leu
35 40 45

Glu Glu Lys Phe Gly Phe Lys Val Leu Tyr Ala Asp Thr Asp Gly Leu
50 55 60

His Ala Thr Ile Pro Gly Ala Asp Ala Glu Thr Val Lys Lys Lys Ala
65 70 75 80

Met Glu Phe Leu Asn Tyr Ile Asn Pro Lys Leu Pro Gly Leu Leu Glu
85 90 95

Leu Glu Tyr Glu Gly Phe Tyr Val Arg Gly Phe Phe Val Thr Lys Lys

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                100                 105                 110

Lys Tyr Ala Val Ile Asp Glu Glu Gly Lys Ile Thr Thr Arg Gly Leu
        115                 120                 125

Glu Ile Val Arg Arg Asp Trp Ser Glu Ile Ala Lys Glu Thr Gln Ala
    130                 135                 140

Arg Val Leu Glu Ala Ile Leu Arg His Gly Asp Val Glu Glu Ala Val
145                 150                 155                 160

Arg Ile Val Arg Glu Val Thr Glu Lys Leu Ser Lys Tyr Glu Val Pro
                165                 170                 175

Pro Glu Lys Leu
            180
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